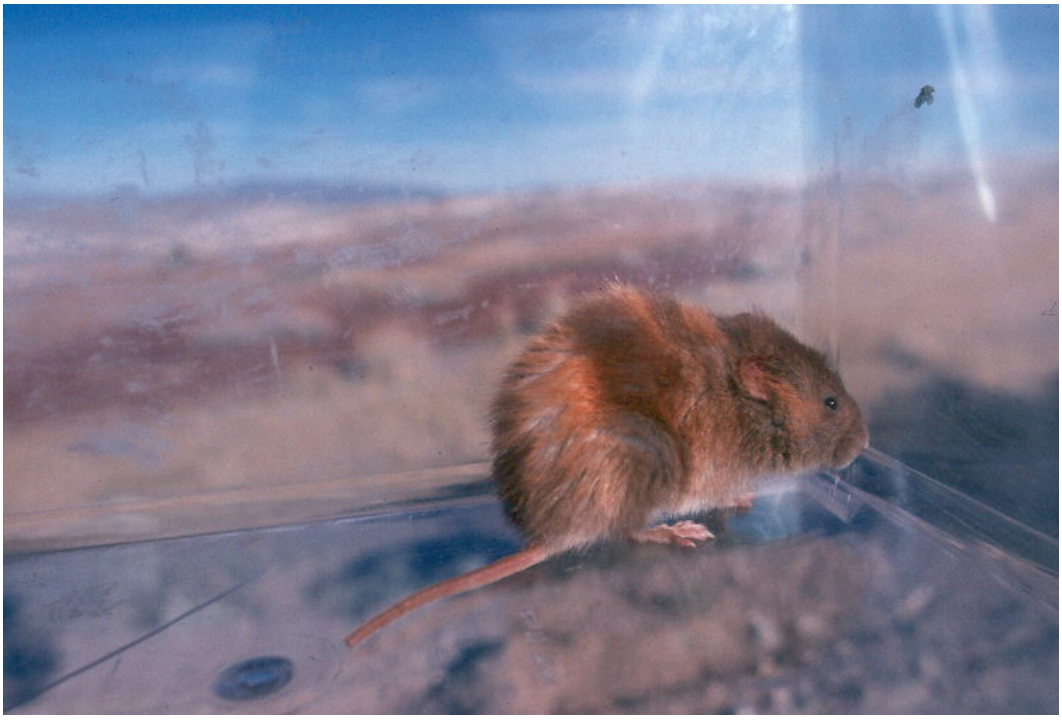
Amargosa vole
Microtus californicus scirpensis

5-Year Review:
Summary and Evaluation



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U.S. Fish and Wildlife Service
Ventura Fish and Wildlife Office
Ventura, CA

January 2009

5-YEAR REVIEW

Amargosa vole (*Microtus californicus scirpensis*)

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview:

The Amargosa vole is a stout-bodied, almost-cylindrical, compact mouse in the *Microtinae* subfamily of Murid rodents. It averages 20.3 centimeters (cm) (7.9 inches (in)) in total length including the tail. Observed weight for male and female Amargosa voles averages 72 grams (gm) (2.54 ounces (oz)) and 59.73 gm (2.11 oz), respectively (Nuewald 2002). Coloration is bright-brown, ranging from cinnamon-buff to buckthorn-brown (Kellogg 1918 *in* U.S. Fish and Wildlife Service 1997).

The historical range of the Amargosa vole was limited to wetland "pockets" extending from the desert community of Shoshone, Inyo County, to the Amargosa Canyon, Inyo County, California. However, the species appears to be extirpated from the Shoshone area due to water diversions and burning of wetland vegetation in the early 1900s. Amargosa voles are now only know to occur in the vicinity of Tecopa Hot Springs, Tecopa, and the northern end of the Amargosa Canyon (Rado and Rowlands 1984, McClenaghan and Montgomery 1998).

Methodology Used to Complete This Review:

This review was prepared by the Ventura Fish and Wildlife Office (VFWO), following the Region 8 guidance issued in March 2008. We used information from the *Recovery Plan for the Amargosa Vole* (U.S. Fish and Wildlife Service 1997), Department of Fish and Game (CDFG) and Bureau of Land Management (Bureau) reports, and the California

Natural Diversity Database (CNDDB) maintained by the California Department of Fish and Game (CDFG). The recovery plan for the Amargosa vole and agency reports were our primary sources of information used to update the species' status and threats. This 5-year review contains updated information on the species' biology and threats, and an assessment of that information compared to that known at the time of listing. There has been no previous 5-year review. We focus on current threats to the species that are attributable to the Act's five listing factors. The review synthesizes all this information to evaluate the listing status of the species and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

Contact Information:

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Federal Register (FR) Notice Citation Announcing Initiation of This Review: A notice announcing initiation of the 5-year review of this species and the opening of a 60-day period to receive information from the public was published in the *Federal Register* on March 5, 2008 (73 FR 11945). The Service received one response to the notice, which we have considered in preparing this 5-year review.

Listing History:

Original Listing
FR Notice: 49 FR 45160
Date of Final Listing Rule: November 15, 1984
Entity Listed: Subspecies – Amargosa vole (*Microtus californicus scirpensis*)
Classification: Endangered

State Listing
California listed the Amargosa vole as a State endangered species on September 2, 1980 (Title 14 California Administrative Code, Section 670.5).

Review History: The general status of the Amargosa vole was reviewed during the preparation of the *Recovery Plan for the Amargosa Vole* in 1997 (U.S. Fish and Wildlife Service 1997).

Species' Recovery Priority Number at Start of 5-Year Review: The recovery priority number for the Amargosa vole is 6 according to the Service's 2007

Recovery Data Call for the Ventura Fish and Wildlife Office, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, September 21, 1983). This number indicates that the Amargosa vole is a subspecies that faces a high degree of threat and has a low recovery potential.

Recovery Plan or Outline

Name of Plan or Outline: *Recovery Plan for the Amargosa Vole*
Date Issued: September 1997.
Dates of previous revisions: There have been no revisions to this plan.

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Endangered Species Act defines "species" as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition of species under the Act limits listing as distinct population segments to species of vertebrate fish or wildlife. The 1996 Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Endangered Species act (61 FR 4722, February 7, 1996) clarifies the interpretation of the phrase "distinct population segment" for the purposes of listing, delisting, and reclassifying species under the Act.

We have no new relevant information regarding the application of the DPS policy to the Amargosa vole.

Information on the Species and its Status

Species Biology and Life History

The Amargosa vole was originally described as a distinct species (*Microtus scirpensis*) (Bailey 1900 *in* U.S. Fish and Wildlife Service 1997), but was later reclassified as *Microtus californicus scirpensis* (Kellogg 1918 *in* U.S. Fish and Wildlife Service 1997). The Amargosa vole is a stout-bodied, almost-cylindrical, compact mouse. It averages 20.3 cm (7.9 in) in total length including the tail. Observed weight for male and female Amargosa voles averages 72 gm (2.54 oz) and 59.73 gm (2.11 oz), respectively (Nuewald 2002). Coloration is bright-brown, ranging from cinnamon-buff to buckthorn-brown (Kellogg 1918 *in* U.S. Fish and Wildlife Service 1997). Researchers have also observed a blonde coat color in at least one location (McClenaghan and Montgomery 1998). Other variations in appearance include kinked tails and red-and-white-striped coat colorations (Nuewald 2002). Distinguishing characteristics from other voles include the bright pelage coloration, and a small skull with comparatively large zygomatic width (Kellogg 1918 *in* U.S. Fish and Wildlife Service 1997).

Because most research on the Amargosa vole has consisted of distribution and abundance studies, we know little about the basic biology of this species. However, we can make some inferences based on what we known about other *Microtus californicus* subspecies. In other subspecies of *Microtus californicus,* populations are active throughout the year. Activity usually occurs in daylight hours during winter months, although animals may become crepuscular and nocturnal through the summer (Madison 1985). Voles (*Microtus* spp.) chiefly consume grasses, forbs, and seeds (Heske et al. 1984). Grasses in the genera *Hordeum, Bromus,* and *Lolium* were included as food items in a central California vole population (Gill 1977), although those green, succulent plants most abundant in occupied habitats are probably consumed in the greatest amounts (Zimmerman 1965). When seasonally available, green emergent vegetation comprises the bulk of the diet; grass seeds predominate in the diet during the summer and autumn (Batzli and Pitelka 1971).

Voles are primary consumers and often the principal herbivores within occupied habitats (Rose and Birney 1985). They may excavate an extensive underground network of runways and tunnels (Wolff 1985), and in dense cover frequently develop extensive surface runways (Taitt and Krebs 1985). Voles generally lack physiological or morphological characteristics necessary to tolerate high temperatures (Rose and Birney 1985), and their inability to concentrate urine and conserve water are major reasons for the vole's distributional restriction to mesic and wetland habitats (Getz 1985); California voles require regular intake of large amounts of water, meeting or exceeding 10 percent of body weight per day (Batzli and Pitelka 1971).

Microtus californicus home range size is typically small. During a study of California voles near San Francisco Bay, Krebs (1966) noted the tendency of the species to "remain in a restricted area", with few animals dispersing distances over 120 meters (400 feet). Amargosa vole dispersal is likely limited by the patchwork nature of its marsh habitat (Nuewald 2002).

Other *Microtus californicus* subspecies reach reproductive maturity when females attain a weight of 25.5-31.1 gm (0.9-1.1 oz) and males a weight of 34-39.6 gm (1.2-1.4 oz) (Hoffmann 1958). In central California, litter size increases from about three at the beginning of the breeding season in the fall, to a peak of about six in the spring (Hoffmann 1958). Mean litter size for the species is 4.7 (Nadeau 1985). Young are born after a gestation of 21 days, and weaning occurs after 14 days (Nadeau 1985).

The life expectancy for most *Microtus californicus* subspecies is short. During a 2-year study of *Microtus californicus* in grasslands east of San Francisco Bay, Krebs (1966) estimated the average longevity of adult males and adult females at about 8 weeks and 12.5 weeks, respectively. However, some observations indicate that Amargosa voles may live longer than this, and researchers have observed one Amargosa vole that lived for at least 1 year (McClenaghan, pers. comm. 2005).

Social systems of subspecies of *Microtus californicus* reportedly range from monogamy to polygamy (Wolff 1985). Reproduction may occur at any time of year, but it is

primarily influenced by factors such as temperature and precipitation that determine availability of food and water (Hoffmann 1958, Seabloom 1985). In Amargosa vole populations, McClenaghan and Montgomery (1998) observed that a greater percentage of males and females were in reproductive condition in June than in November. In central California, *Microtus californicus* populations peak during the spring and begin declining in late summer (Hoffmann 1958). By late summer or early fall, most *Microtus californicus* populations consist predominately of adults. Juveniles of this species are most abundant during the winter and spring (Batzli and Pitelka 1971). In Amargosa vole populations, McClenaghan and Montgomery (1998) found that the age structure changed significantly through the year, with the proportion of adults increasing and the proportion of subadults and juveniles decreasing between June and November.

Seasonal population fluctuations for *Microtus californicus* observed during a 2-year grassland study near San Francisco Bay ranged from 4 to 64 animals per acre (Krebs 1966). Batzli and Pitelka (1971) observed 2- to 4-year cyclic irruptions in these same populations. From 1959 to 1973, Lidicker (1973) examined such an irruption, where *Microtus californicus* populations on Brooks Island in San Francisco Bay ranged from a low of 20 to a high of 632 per acre. Causes of subsequent population "crashes" are unclear, but food quality and availability may play a role (Batzli and Pitelka 1971). Cyclic vole population explosions may result in intensive intraspecific competition for available resources as observed with *Microtus californicus* populations in Contra Costa County, California (Heske et al. 1984). However, not all vole species experience population cycles (Tamarin et al. 1987). We do not have enough information to determine if these types of cyclic population irruptions and crashes occur in the Amargosa vole subspecies.

McClenaghan and Montgomery (1998) performed mark-recapture studies on three Amargosa vole marshes and estimated a month-to-month survival rate of 83 percent and a 5-month survival rate of 32 percent. In addition, their research indicated a slight excess of females in both of their sampling periods. While this data was not statistically significant, it may indicate a skewed sex ratio in the Amargosa vole.

Spatial Distribution

The historical range of the Amargosa vole was limited to wetland "pockets" extending from the desert community of Shoshone, Inyo County, to the Amargosa Canyon, Inyo County, California. Bailey (1900 *in* U.S. Fish and Wildlife Service 1997) collected the type specimens for the Amargosa vole in 1891 from a small "tule" marsh near Shoshone. Subsequent unsuccessful trapping attempts at this location led to the erroneous conclusion that the subspecies was extinct (Kellogg 1918 *in* U.S. Fish and Wildlife Service 1997). In the 1930s, additional trapping efforts to relocate specimens were successful near Shoshone and near the community of Tecopa Hot Springs (Alen 1942 in Bleich 1979b).

In the late 1970s, additional surveys trapped 21 Amargosa voles at seven sites near Tecopa and Tecopa Hot Springs (see below; Appendix 1, 2, and 4 – sites 7, 12, 14, 25,

34, 36, and 40) (Bleich 1979a). At the time of listing, these marsh locations constituted the known distribution of the Amargosa vole (49 FR 45160). This survey could not find evidence of Amargosa vole occupancy at the type locality near Shoshone, California. In 1982 and 1983, a small mammal trapping effort performed in the Amargosa Canyon and near Tecopa and Tecopa Hot Springs established occupancy of two trapping locations (see Appendix 1 and 4 – sites 10 and 43) (Rado and Rowlands 1984). The location of occupied habitat in the Amargosa Canyon extended the previously known range of the species to the south by about 1.6 kilometer (1 mile). A subsequent trapping inventory of extant wetland "pockets" in 1987 and 1988 documented Amargosa voles or their sign at five sites near Tecopa and Tecopa Hot Springs (see below; Appendix 1, 2, and 4 – sites 7, 9, 16, 54, 56, and 57).

McClenaghan and Montgomery (1998) conducted the most extensive survey of Amargosa vole distribution to date. This study included trapping, sign surveys, or habitat assessments at 48 study sites, including all previously surveyed sites, to determine occupancy. This study located Amargosa voles or their sign at 17 of the 48 sites (see Appendix 1, 2, and 4 – sites 1, 4, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 21, 22, 34, and 56). Based on habitat mapping from past surveys and trapping results, Amargosa vole populations at 3 of the 17 occupied sites (1, 17, and 21) appear to be new populations that did not likely exist in the mid-to-late 1980s when the species was listed (McClenaghan and Montgomery 1998). Previous surveyors had not identified suitable habitat at these locations. Eight of the 17 occupied sites (see Appendix 1 and 2 – sites 7, 9, 10, 12, 14, 16, 34, and 56) were also known to be occupied in the mid-to-late 1980s (Bleich 1979a, Rado and Rowlands 1984, Murphy and Freas 1989) indicating that these populations have likely persisted from at least the time of listing until the most recent surveys. For the remaining six sites (Appendix 1 and 2 – sites 4, 8, 13, 18, 19, and 22) found to be occupied in 1997 (McClenaghan and Montgomery 1998), we cannot determine whether they were occupied at the time of listing because past studies either did not survey these locations or did not survey at a sufficient level to confirm the absence of Amargosa voles.

It is difficult to draw any conclusions regarding trends in occupancy status for the remaining 31 sites surveyed in 1997. McClenaghan and Montgomery (1998) were either unsuccessful at trapping voles or did not locate signs of voles or did not find suitable habitat for voles at these 31 sites. Of the remaining 31 sites studied, one of the 31 sites (site 40) was known to be occupied previously (Bleich 1979a), but the habitat was no longer suitable for the Amargosa vole in 1997 (McClenaghan and Montgomery 1998). Seven other sites of the 31 also did not have suitable vole habitat in 1997, but we do not know what the habitat condition was at the time of listing at these sites. Although McClenaghan and Montgomery (1998) found suitable Amargosa vole habitat at 23 of the 31 sites they surveyed, they did not perform sufficient trapping at these locations to determine occupancy.

The most recent surveys for the Amargosa vole occurred in 1999 and 2000 during collection of tissue samples for a genetic study (Nuewald 2002). This further confirmed the continued occupancy of sites 1, 4, 7, 9, 10, 16, and 21. This study also found Amargosa voles at site 54, where Amargosa vole sign was found in 1988 (Murphy and

Freas 1989), but was not found in 1997 (McClenaghan and Montgomery 1998). In addition, Nuewald (2002) was able to trap Amargosa voles at site 15, where previous surveys (Murphy and Freas 1989 and McClenaghan and Montgomery 1998) found no evidence of occupancy. However, as stated previously, we cannot definitively say that these results are new populations because inadequate trapping effort may have affected the results of the previous surveys.

Abundance and Population Trends

It is difficult to accurately assess the current status of the species with the limited information available on its distribution and abundance. For example, impacts have likely resulted in the loss of the species from its type locality in Shoshone, California, and another population (site 40) in the Tecopa area appears to have been lost since the time of listing. However, it also appears likely that there are three new populations of Amargosa vole that were not present at the time of listing. Although only a few surveys have been conducted since listing, eight additional populations have been consistently occupied.

There are little data regarding trends in the relative abundance of Amargosa voles. Only six reports on trapping surveys are available, and only four of these trapped in more than a handful of sites. McClenagahan and Montgomery (1998) provided a summary of these trapping results that cover a period from 1978 to 1997. Of the sites trapped in these four investigations, only eight trapping locations were trapped by more than one of the investigators (see Appendix 4). In addition, not all investigators used a common trapping season, so any population cycling within a given year is likely to confound conclusions regarding real population trends. Differences in trapping intensity by each investigator provide an additional source of error in trying to draw conclusions about trends in population abundance.

Habitat or Ecosystem

The Amargosa vole occurs in isolated wetland habitats where bulrush (*Scirpus* sp.) is a dominant perennial overstory species. Gould and Bleich (1977) located five Amargosa voles in five separate areas where bulrush densities ranged from “moderate” to “high.” Four of the five sites were on slopes of less than 20 percent. The remaining site was on level ground. Bleich (1979a) subsequently captured 14 voles at a single site within “moderate” density bulrush habitat on level ground. Virtually all known trapping sites (six of seven) were closely associated with standing perennial surface water. Vegetation composition at successful trapping locations in the Amargosa Canyon was dominated by an overstory of bulrush, arrow weed *(Pluchea sericea),* seep-weed *(Suaeda torreyanna),* quailbush *(Atriplex lentiformis),* and southern reed *(Phragmites australis).* Understory vegetation included yerba mansa *(Anemopsis californica)* and saltgrass (*Distichilis spicata*). Constituent vegetation at another successful trapping location approximately 5 kilometers (3.1 miles) to the north in the Tecopa Lake Basin consisted of a less diverse plant assemblage dominated by an overstory of bulrush and an understory of yerba mansa, saltgrass, and reeds *(Juncus* sp.) (Rado and Rowlands 1984). McClenaghan and Montgomery (1998) also noted the Amargosa vole’s primary association with bulrush in

wet or lightly-flooded (e.g., 2-5 cm (0.79-1.97 in)) substrates and added that most areas of high abundance occurred at the interface between bulrush and saltgrass habitats. However, they also noted that at least one population was utilizing wet habitats dominated by rushes (*Juncus* sp.) and marsh plants other than bulrush. In total, there is about 1 square kilometer (247 acres) of suitable Amargosa vole habitat divided among various isolated marsh patches (Murphy and Freas 1989, McClenaghan and Montgomery 1998).

Changes in Taxonomic Classification or Nomenclature

No changes in taxonomic classification or nomenclature are proposed at this time.

Genetics

The Amargosa vole has extremely low genetic diversity. Nuewald (2002) looked at genetic diversity in the Amargosa vole and compared it to *Microtus californicus sanctidiegi*, a vole common to coastal southern California. The results showed low genetic diversity at all microsatellite gene loci examined, with the number of alleles (different forms of a gene) per locus averaging one quarter that observed in *Microtus californicus sanctidiegi*. Nuewald (2002) also found that the average level of heterozygosity in the Amargosa vole was only 30 percent of the levels seen in *Microtus californicus sanctidiegi*. We do not know the cause of this low genetic diversity, but the Amargosa vole does not exhibit significant levels of inbreeding (Nuewald 2002). Other factors, such as genetic bottlenecks, founder effect, or genetic drift may play a role. More information is needed on the demography of this species to determine what the potential causes might be. Despite the low genetic diversity demonstrated by the species overall, the Amargosa vole shows a high level of genetic differentiation and a detectable pattern in the distribution of alleles among its subpopulations (Nuewald 2002). The low genetic diversity has generated a large effect of within-population variation compared to between-population variation in some subpopulations (Nuewald 2002).

Species-specific Research and/or Grant-supported Activities

Since listing of the Amargosa vole, The Nature Conservancy (TNC) in coordination with the Amargosa Conservancy have acquired approximately 1,093 hectares (2,700 acres) of private land in the Tecopa and Tecopa Hot Springs area to help consolidate management of the Bureau's Areas of Critical Environmental Concern (ACECs). In addition, CDFG, TNC, the Service, and the Desert Manager's Group obtained a grant in 2007 through section 6 of the Endangered Species Act to purchase an additional 16-hectare (40-acre) parcel that contains occupied Amargosa vole habitat near Tecopa Hot Springs.

In 1997, CDFG funded a range-wide distribution and abundance survey for the Amargosa vole by Leroy McClenaghan (San Diego State University) and Stephen Montgomery out of section 6 funds.

Five-Factor Analysis

The following five-factor analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

The 1984 listing rule for the Amargosa vole (49 FR 45160) identified habitat loss due to human activities in the Shoshone and Tecopa Hot Springs areas as one of the factors that contributed to its listing. These activities included livestock grazing, burning of marsh habitat for pasture land, diversion and channelization of springs in the Shoshone area (see Appendix 3), and development of mineral baths and mobile home courts in the Tecopa Hot Springs area (see Appendix 3). These activities had greatly modified or eliminated suitable Amargosa vole habitat in these areas.

Pre-listing Conservation Actions

Prior to the listing of this species, the Bureau recognized the importance of the Tecopa, Tecopa Hot Springs, and Amargosa Canyon areas by designating the Amargosa River and Grimshaw Areas of Critical Environmental Concern (ACEC) to specifically manage for wildlife habitat, vegetation, outstanding scenery, and riparian resources (Bureau 1980). The boundaries of the two new ACECs, totaling 4,169 hectares (10,302 acres) of public and private lands, encompassed most known habitat for the Amargosa vole (Bureau 1983a, 1983b). The California Desert Conservation Area Plan identified the control of vehicular access and increased Federal presence, restriction of mineral exploration and development, monitoring and limiting of water development, and control of nonnative species as general management requirements for the public land portions of the new ACECs (Bureau 1980). In 1983, the Bureau completed management plans for both ACECs (Bureau 1983a, 1983b). Management prescriptions identified in the plans for the protection of Amargosa vole habitat included removal of salt cedar (*Tamarix* spp.), acquisition of private lands, development of cooperative landowner agreements, restriction of vehicular access, habitat monitoring, completion of a mineral withdrawal, and identification of spring water reserves (Bureau 1983a, 1983b). At the time of listing, much of the habitat for the Amargosa vole, including many areas within the Bureau's ACECs, were still in private ownership, which restricted the Bureau's ability to implement its plans and manage threats to Amargosa vole habitat. By 1997, land acquisitions by The Nature Conservancy (TNC) and the Bureau brought most of the Amargosa vole's preferred habitat under the administration of the Bureau, California State Lands Commission, or TNC (U.S. Fish and Wildlife Service 1997). No active management of the TNC and State Land's Commission lands occurred prior to listing.

Fire and Grazing

The consolidation of lands within the ACEC allowed the Bureau to more effectively manage threats to Amargosa vole habitat. The Bureau established control of vehicular

access and began implementation of the remaining aspects of its ACEC plans. By 1997, purposeful burning to clear marsh vegetation was no longer a major threat to Amargosa vole habitat (U.S. Fish and Wildlife Service 1997). Despite this decrease in widespread use of fire to clear marsh vegetation, burning of small patches of bulrush vegetation near Tecopa Hot Springs has occurred on private lands as recently as 2008 and continues to be a localized threat (Scofield pers. comm. 2008). The potential for wildfire also continues, but McClenaghan and Montgomery (1998) noted few indications of fire in 1997 and postulated that the likelihood of a wildfire eliminating large amounts of Amargosa vole habitat was low because the habitat tends to be narrow and completely disconnected from other habitat patches.

Cattle grazing continued to be a threat through the late 1990s, with heavily damaged areas of potential Amargosa vole habitat downstream from China Ranch and at other locations along the river further to the north (McClenaghan and Montgomery 1998). By the end of the 1990s, the Bureau's Barstow Field Office had removed all livestock from the ACEC, and grazing ceased to pose a threat to Amargosa vole habitat (Chavez pers. comm. 2008).

Diversion of Spring Flows and Alteration of Historical Marsh Configuration

New and/or unresolved threats associated with groundwater pumping, salt cedar invasion, and diversions and other man-made barriers to natural spring flow persist despite the gains that the Bureau has made in management of ACECs. The listing rule specifically identified the diversion of Shoshone Springs to support a high school swimming pool and the development of springs in the Tecopa Hot Springs area for mineral baths as major sources of spring flow modification affecting Amargosa vole habitat (49 FR 45160). The recovery plan also identified these specific modifications as sources of wetland degradation and loss (Service 1997). Because wetland extent, location, and quality has not been monitored at Tecopa Hot Springs, it is unclear whether the persistence of these modifications is continuing to degrade the overall quality and quantity of Amargosa vole habitat or reached a stable state. Outflow from the mineral bathhouses in this area continue to support Amargosa vole habitat but we do not know if the overall trend in quality and quantity of the habitat has increased, decreased, or stabilized since the installation of the bathhouse diversions. It is clear that bulrush marshes that generally support Amargosa voles no longer exist in Shoshone, and surveyors have been unsuccessful in locating it there since the 1940s (Bleich 1979a, Bleich 1979b, Murphy and Freas 1989, McClenaghan and Montgomery 1998). We do not know whether the loss of habitat in this area occurred prior to the diversion of Shoshone Spring, but it is likely that diversion of this spring flow has greatly reduced the likelihood of bulrush marsh regeneration at this site.

Although not mentioned in the listing rule, construction of the Tonopah and Tidewater Railroad line in 1906, bisecting the Tecopa Lake Basin and construction of the Old Spanish Trail Highway, has likely altered the historical configuration of marshes in the Tecopa and Tecopa Hot Springs area (Service 1997). We do not know how this

alteration in marsh distribution has affected and may continue to affect the long-term persistence of this species.

Groundwater Development

The recovery plan identified the potential development and exploitation of subterranean water sources for geothermal energy production and domestic consumption as a new threat to Amargosa vole habitat that the listing rule (49 FR 45160) and the Bureau's management plans had not previously recognized (U.S. Fish and Wildlife Service 1997). Although no monitoring has occurred for springs that support Amargosa vole habitat, McClenaghan and Montgomery (1998) noted that hot spring flows in the area have remained constant for many years. However, they also suggested that distant groundwater uses for agriculture or other uses could cause spring outputs to decline.

Immediate impacts to spring outflows from groundwater pumping are unlikely because there is only one groundwater well within the historical range of the Amargosa vole; this well is near Shoshone, California (Moreo et al. 2003). However, we cannot currently dismiss the potential effect that intense groundwater development in southern Nevada may have on future spring discharge given the regional connectivity of groundwater systems in this area, the source of recharge for the groundwater that enters the Shoshone and Tecopa area, and the predicted paths of regional groundwater flow. The springs associated with Amargosa vole habitat in the Shoshone, Tecopa, and Amargosa Canyon areas are associated with a regional carbonate aquifer that is part of the Death Valley Regional Flow System (Faunt et al. 2004). Although groundwater pumping directly within the range of the vole is not an issue, pumping elsewhere within the same regional carbonate aquifer is a concern. Using data from Moreo et al. (2003), San Juan et al. (2004) calculated that nearly 9,300 groundwater wells were drilled in Pahrump Valley, which overlies the carbonate aquifer, between 1913 and 1998 and had pumped approximately 2.2 billion cubic meters (2.9 billion cubic yards) of groundwater during that period. The estimated annual groundwater withdrawal in the Pahrump Valley in 1998 was approximately 43.9 million cubic meters (57.4 million cubic yards) of water (San Juan et al. 2004). The Pahrump Valley lies between the springs along the Amargosa River and the source of recharge for the carbonate aquifer.

Most of the groundwater wells that presently exist in the Pahrump Valley pump water from the local basin-fill aquifer, are less than 150 m (492 ft) deep, and do not penetrate the deeper carbonate aquifer (Moreo et al. 2003). The present level of pumping in the Pahrump Valley at this depth does not appear to be affecting the carbonate aquifer and the springs that it supports within the range of the Amargosa vole (Harrill 1986 *in* Dettinger et al. 1995). However, the potential for utilization of the carbonate aquifer to meet the water needs of Las Vegas and Pahrump's growing populations could threaten spring outflows that support Amargosa vole habitat. Currently, there are several Nevada Counties (Nye, Lincoln, Clark, and White Pine) investigating the potential for tapping into the regional carbonate aquifer to meet future needs (Deacon et al. 2007). The Southern Nevada Water Authority (SNWA) filed 147 water rights applications in 1989 and hopes to obtain 22,203 hectare-meters (180,000 acre-feet) of water per year from

aquifers in central, eastern, and southern Nevada (SNWA 2004 *in* Deacon 2007). There are currently no Southern Nevada Water Authority water rights applications in Pahrump Valley, but similar attempts to utilize deep carbonate water in Pahrump Valley could affect Amargosa vole habitat in the future. We cannot currently predict the magnitude or timing of groundwater effects if carbonate water pumping begins in Pahrump Valley.

Salt Cedar

The recovery plan identified the establishment of salt cedar (*Tamarix* spp.) in the Amargosa River drainage, especially the northern portion of the Amargosa Canyon, as a continuing threat that was likely diminishing Amargosa vole habitat quality through replacement of bulrush marshes (U.S. Fish and Wildlife Service 1997). McClenaghan and Montgomery (1998) indicated that salt cedar was of little consequence in Amargosa vole habitat north of the town of Tecopa, but they identified numerous salt cedar infestations within the Amargosa Canyon. Nuewald (2002) noted that the takeover of historical bulrush marshes by salt cedar severely decreased their suitability. The high density of this tree likely reduces standing water that otherwise might foster the development of significant stands of suitable Amargosa vole habitat (McClenaghan and Montgomery 1998). We do not currently have any information on the extent of salt cedar within Amargosa vole habitat or the amount of habitat that has been lost due to salt cedar invasion. The Bureau is currently undertaking steps to remove salt cedar from the Amargosa River drainage, but they have not yet removed any from currently occupied Amargosa vole habitat (Scofield pers. comm. 2008). However, removal of salt cedar in other areas of the Amargosa River watershed will remove seed sources that should provide for long-term success of future efforts within Amargosa vole habitat. In addition, removal of salt cedar in some areas of historical bulrush marshes may allow for regeneration of habitat for the Amargosa vole.

FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization for commercial, recreational, scientific, or educational purposes was not considered a threat at the time of listing in 1984, nor do we believe this to be a threat at the present time.

FACTOR C: Disease or Predation

Disease: We have no information on disease in Amargosa vole populations.

Predation: Although not identified in the final listing rule, predation by domestic cats (*Felis catus*) in the Tecopa and Tecopa Hot Springs area is a potential source of mortality (U.S. Fish and Wildlife Service 1997, McClenaghan and Montgomery 1998). In the revision of the Amargosa River ACEC Plan, the Bureau identified the control of this threat as a management priority (Bureau 2007), but the Bureau is not currently taking any action to address this threat.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

The inadequacy of existing regulatory mechanisms was not analyzed in the 1984 listing rule for the Amargosa vole (49 FR 45160). However, there are several State and Federal laws and regulations that are pertinent to the Amargosa vole, each of which contribute to the conservation of the Amargosa vole in varying degrees.

California Endangered Species Act (CESA): The CESA prohibits the unauthorized take of State-listed threatened or endangered species. CESA requires State agencies to consult with the California Department of Fish and Game on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat.

On September 2, 1980, California listed the Amargosa vole as a California State endangered species (Title 14 California Administrative Code, Section 670.5). Pursuant to the California Fish and Game Code and the CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes, and to allow take that is incidental to otherwise lawful activities.

The authority of the state to regulate external threats to the Amargosa vole is limited to private lands. The Amargosa vole occurs mainly on Federal lands administered by the Bureau of Land Management. These Federal agencies are responsible for regulating activities on Federal lands that may adversely affect Amargosa voles. Consequently, the regulatory mechanisms that CESA provides are not sufficient to protect this species from threats throughout the entirety of its range.

Endangered Species Act of 1973, as amended (Act): The Act is the primary Federal law providing protection for this species. Since its listing, the Service has analyzed the potential effects of Federal projects under section 7(a)(2), which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 C.F.R. § 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project. The Service's responsibilities include administering the Act, including sections 7, 9, and 10. Section 9 of the Act prohibits the taking of any federally listed endangered or threatened species. Section 3(18) of the Act defines "take" to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Service regulations (50 CFR 17.3) define "harm" to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. Harassment is defined by the Service as an intentional or negligent action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. The Act

provides for civil and criminal penalties for the unlawful taking of listed species. Incidental take refers to taking of listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 C.F.R. § 402.02). For projects without a Federal nexus that would likely result in incidental take of listed species, the Service may issue incidental take permits pursuant to section 10(a)(1)(B). To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved habitat conservation plan (HCP) that details measures to minimize and mitigate the project's adverse impacts to listed species. Regional HCPs in some areas now provide an additional layer of regulatory protection for covered species, and these HCPs are coordinated with the related NCCP-State program.

Since the time of its listing, two biological opinions have been issued to address the potential threats to the Amargosa vole from a variety of actions. Actions for which the Service has issued biological opinions for effects to the Amargosa vole include salt cedar removal and implementation of the revised Amargosa River ACEC Plan.

National Environmental Policy Act (NEPA): NEPA (42 U.S.C. 4371 *et seq*.) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of such projects with a Federal nexus, NEPA requires the agency to analyze the project for potential impacts to the human environment, including natural resources. In cases where that analysis reveals significant environmental effects, the Federal agency must propose mitigations that could offset those effects (40 C.F.R. 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public. Additionally, NEPA is only required for projects with a Federal nexus, and therefore actions taken by private landowners or on State lands are not required to comply with this law.

Federal Land Policy and Management Act of 1976 (FLPMA): The Bureau of Land Management is required to incorporate Federal, State, and local input into their management decisions through Federal law. The Federal Land Policy and Management Act of 1976 (FLPMA) (Public Law 94-579, 43 U.S.C. 1701) was written "To establish public land policy; to establish guidelines for its administration; to provide for the management, protection, development and enhancement of the public lands; and for other purposes." Section 102(f) of the FLPMA states that "The Secretary shall allow an opportunity for public involvement and by regulation shall establish procedures…to give Federal, State, and local governments and the public, adequate notice and opportunity to comment upon and participate in the formulation of plans and programs relating to the management of the public lands." Therefore, through their management plans, the Bureau of Land Management is responsible for including input from Federal, State, and local governments and the public. Additionally, Section 102(c) of the FLPMA states that the Secretary shall "give priority to the designation and protection of areas of critical environmental concern" in the development of plans for public lands. Although the Bureau of Land Management has a multiple-use mandate under the FLPMA which allows for grazing, mining, and off-road vehicle use, it also has the ability under the

FLPMA to establish and implement special management areas such as Areas of Critical Environmental Concern, wilderness, research areas, etc., that can reduce or eliminate actions that adversely affect species of concern.

Based on the above, the Bureau of Land Management has authority to manage the land and activities under their administration to conserve the Amargosa vole. Since listing, Federal agencies have taken steps to enhance habitat through salt cedar removal and land acquisitions that will consolidate management of Amargosa vole habitat within the Amargosa River ACEC. However, spring diversions and marsh burning on private lands continue to adversely affect Amargosa vole habitat. In addition, the potential for future ground water pumping from the regional carbonate aquifer in private communities along the California-Nevada state line is not regulated by any Federal agencies. Consequently, some of the identified threats to this species are not within the regulatory control of NEPA or FLPMA.

FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

Genetic Consequences of Small, Fragmented Populations

As discussed previously, the Amargosa vole has low genetic diversity and a limited amount of gene flow between populations (Nuewald 2002). Loss of genetic diversity in small populations may decrease the potential for persistence in the face of long-term environmental change (Shaffer 1981, Shaffer 1987; Primack 1998). Loss of genetic diversity can also result in decline in fitness from expression of deleterious recessive alleles (Meffe and Carroll 1994). For example, O'Brien et al. (1985 *in* Nuewald 2002) demonstrated that cheetah populations that are depauperate in genetic variation show decreased fitness-related traits, such as an increased number of morphologically abnormal sperm and decreased fecundity. These problems can lead to a poorer "match" of the organism to its environment, reducing individual fitness and increasing the probability of population or species extinction (Meffe and Carroll 1994). Low genetic diversity may similarly reduce the fitness of the Amargosa vole, although no research has been done to determine the relationship of genetic variation and reduced fitness in that subspecies.

Interspecific Competition

Trapping results indicate a significant negative correlation between the number of Amargosa voles captured at a site when compared with house mouse (*Mus musculus*) captures, which suggests a possible interspecific competitive relationship (McClenaghan and Montgomery 1998). We do not have any information on the magnitude or extent of this threat at this time.

Climate Change

Climate change is a new threat identified since listing that may affect the Amargosa vole's wetland habitat as a result of prolonged drought. Current climate change

predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field et al. 1999, Cayan et al. 2005, IPCC 2007). However, predictions of climatic conditions for smaller sub-regions such as California remain uncertain. It is unknown at this time if climate change in California will result in a warmer trend with localized drying, higher precipitation events, or other effects. While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make accurate predictions regarding its effects to particular species at this time.

III. RECOVERY CRITERIA

Recovery plans provide guidance to the Service, States, and other partners and interested parties on ways to minimize threats to listed species, and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, we may determine that, over all, the threats have been minimized sufficiently, and the species is robust enough, to downlist or delist the species. In other cases, new recovery approaches and/or opportunities unknown at the time the recovery plan was approved may be more appropriate for achieving recovery. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall, recovery is a dynamic process requiring adaptive management, and assessing a species' degree of recovery is likewise an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan. We focus our evaluation of species status in the 5-year review on progress that has been made toward recovery since the species was listed by eliminating or reducing the threats discussed in the five-factor analysis. In that context, progress towards fulfilling recovery criteria serves to indicate the extent to which threat factors have been reduced or eliminated.

The recovery plan for the Amargosa vole was published in 1997. The goal of the plan is to recover the vole to the point where it can be downlisted to threatened. The plan did not establish delisting criteria for the species because of the lack of information relating to the species' biology and management requirements.

Downlisting Criterion: The Amargosa vole may be downlisted to threatened status when extant wetland habitats and water sources for perpetuating these areas are secured and managed to maintain stable or increasing vole populations.

This criterion addresses listing factor A. The Bureau, CDFG, TNC, and the Service have taken steps to secure land containing Amargosa voles and their habitat, and the Bureau has developed management plans for their area. However, many spring sources that support these habitats are still in private ownership. Spring diversions and channelizations established before the Amargosa vole was listed are still present and continue to affect the location and extent of marsh habitat. Salt cedar infestations and

localized burning of some of the bulrush marsh vegetation that remains in private ownership continues to impact populations and habitats. In addition, the potential for intense groundwater development of the carbonate aquifer in Pahrump Valley, Nevada, could impact spring outflows that support Amargosa vole habitat in the future. In addition, the information on the population trends needed to meet the downlisting criterion is not currently available. Therefore, we conclude that the downlisting criterion has not been achieved.

IV. SYNTHESIS

The final listing rule for the Amargosa vole identified loss of habitat as a result of livestock grazing, marsh burning, and diversion and channelization of spring outflows as the main cause for listing (49 FR 45160). The Bureau and other landowners have have made significant progress toward reducing and in some cases eliminating threats to the vole from their land. The Bureau has established an ACEC that encompasses most of the current range of the Amargosa vole, controlled vehicular access, removed grazing, reduced the incidence of marsh burning, removed some salt cedar seed sources, and worked with TNC to acquire private lands to protect Amargosa vole habitat.

Although many of these threats have now been eliminated or reduced, it is difficult to accurately assess the current status of the species with the limited information available on its distribution and abundance. For example, impacts have likely resulted in the loss of the species from its type locality in Shoshone, California, and another population (site 40) in the Tecopa area appears to have been lost since the time of listing. However, it also appears likely that there are three new populations of Amargosa vole that were not present at the time of listing. Although only a few surveys have been conducted since listing, eight additional populations have been consistently occupied.

Despite efforts by the Bureau and other landowners, unresolved threats to the Amargosa vole persist. Localized burning of marsh vegetation on private land, salt cedar invasion of Amargosa vole habitat, and the diversion of spring outflows continue to threaten Amargosa vole habitat. In addition, predation by domestic cats, interspecific competition with house mice, and the genetic consequences of small fragmented populations pose additional threats. The possibility of groundwater pumping from the carbonate aquifer in Pahrump Valley, Nevada, also poses a potential future threat to habitat. Due to these ongoing and potential threats and lack of information on population trends, we recommend that the endangered status of the Amargosa vole under the Act remain unchanged.

V. RESULTS

Recommended Listing Action:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (indicate reason for delisting according to 50 CFR 424.11):
    ____ *Extinction*
    ____ *Recovery*
    ____ *Original data for classification in error*
__✓__ No Change

New Recovery Priority Number and Brief Rationale: No change needed.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

These recommendations are provided in priority order:

a. The Service should work with CDFG, the Bureau, TNC, and the Amargosa Conservancy to continue acquisition of fee title or conservation easements on private lands that contain Amargosa vole habitat.

b. The Bureau, CDFG, and the Service should continue to participate in interstate forums regarding the groundwater issues in the Death Valley Regional Flow System and monitor county and municipal plans for groundwater development in southern Nevada (especially Pahrump Valley).

c. The Service and CDFG should identify private landowners in the Tecopa and Tecopa Hot Springs area that have Amargosa vole habitat on their lands and notify them of the potential adverse effects from burning of bulrush vegetation.

d. The Service, CDFG, Inyo County, and the Bureau should investigate the magnitude of the impact associated with domestic cat predation and take steps to educate residents in Tecopa and Tecopa Hot Springs of the threat that domestic cats pose to this species. If necessary, Inyo County should explore the need for an ordinance to prohibit free-roaming cats in this area.

e. The Service, CDFG, and the Bureau should develop a spring discharge monitoring program for all springs that support Amargosa vole habitat to track changes in water volume.

f. The Bureau, CDFG, and the Service should work with its partners to remove salt cedar from all existing Amargosa vole habitat and from areas where its removal may result in regeneration of historic bulrush marsh habitats.

g. The Service and CDFG should initiate a range-wide monitoring effort for this species of sufficient intensity to determine trends in occupancy for all suitable Amargosa vole habitat.

h. The Bureau, CDFG, and the Service should investigate the potential for restoring bulrush corridors and/or intermediate habitats between existing occupied habitats to promote increased gene flow between these fragmented populations.

i. The Service and CDFG should investigate the magnitude of the impact related to interspecific competition with house mice and take steps to control it, if necessary.

j. The Bureau, CDFG, and the Service should investigate the potential impacts that the Tonopah and Tidewater Railroad Grade has on bulrush marsh distribution and determine if breaching of this barrier would create additional Amargosa vole habitat.

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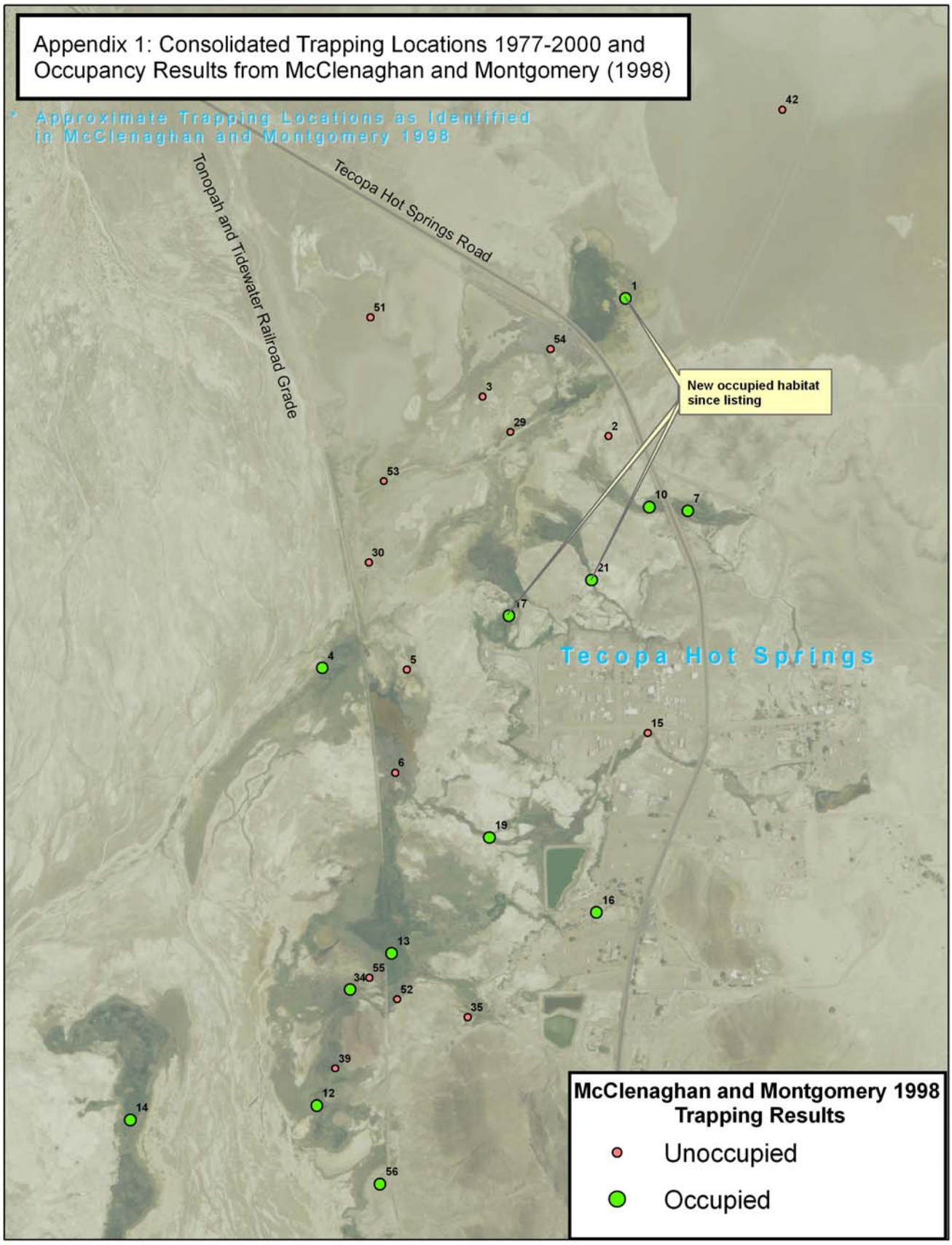
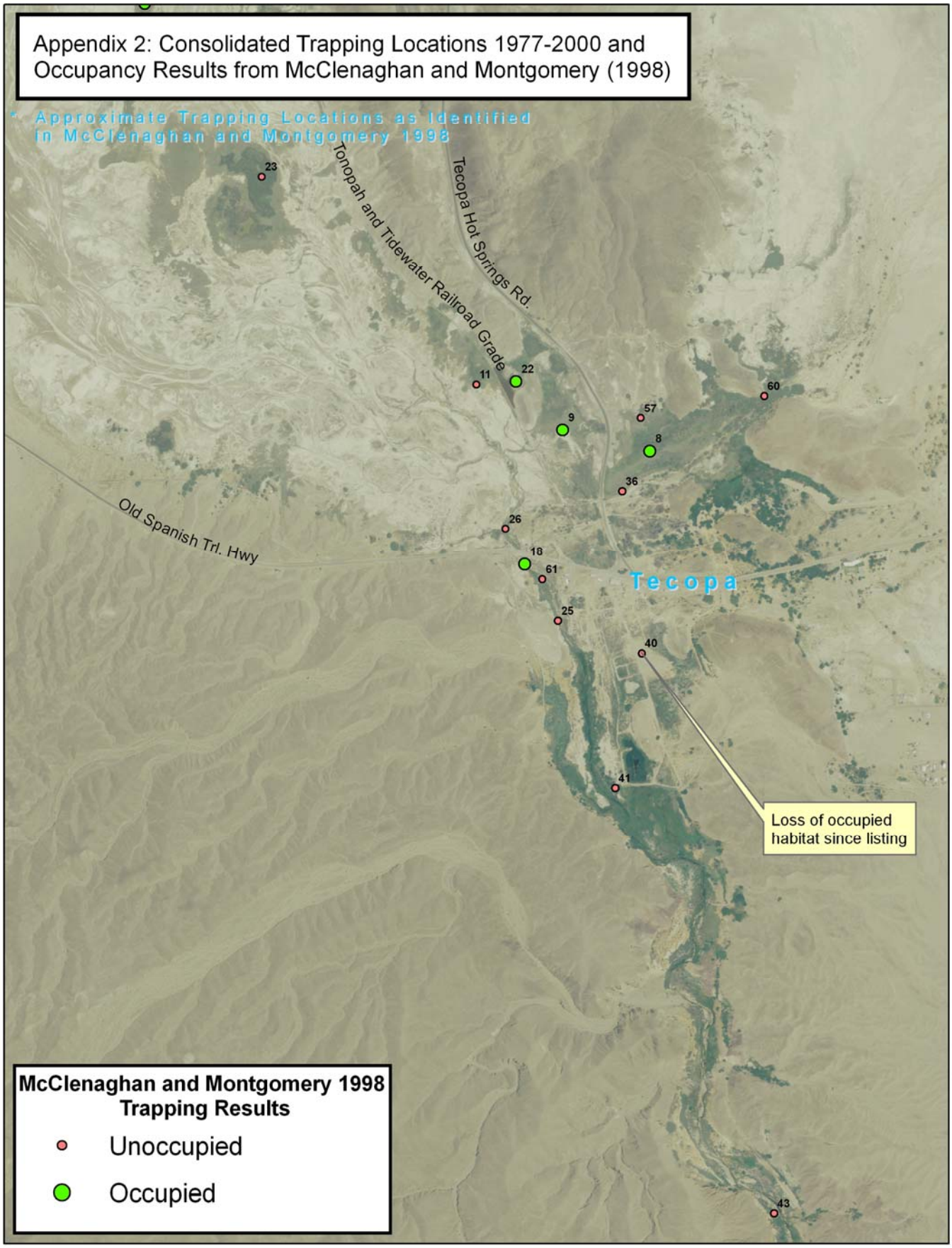
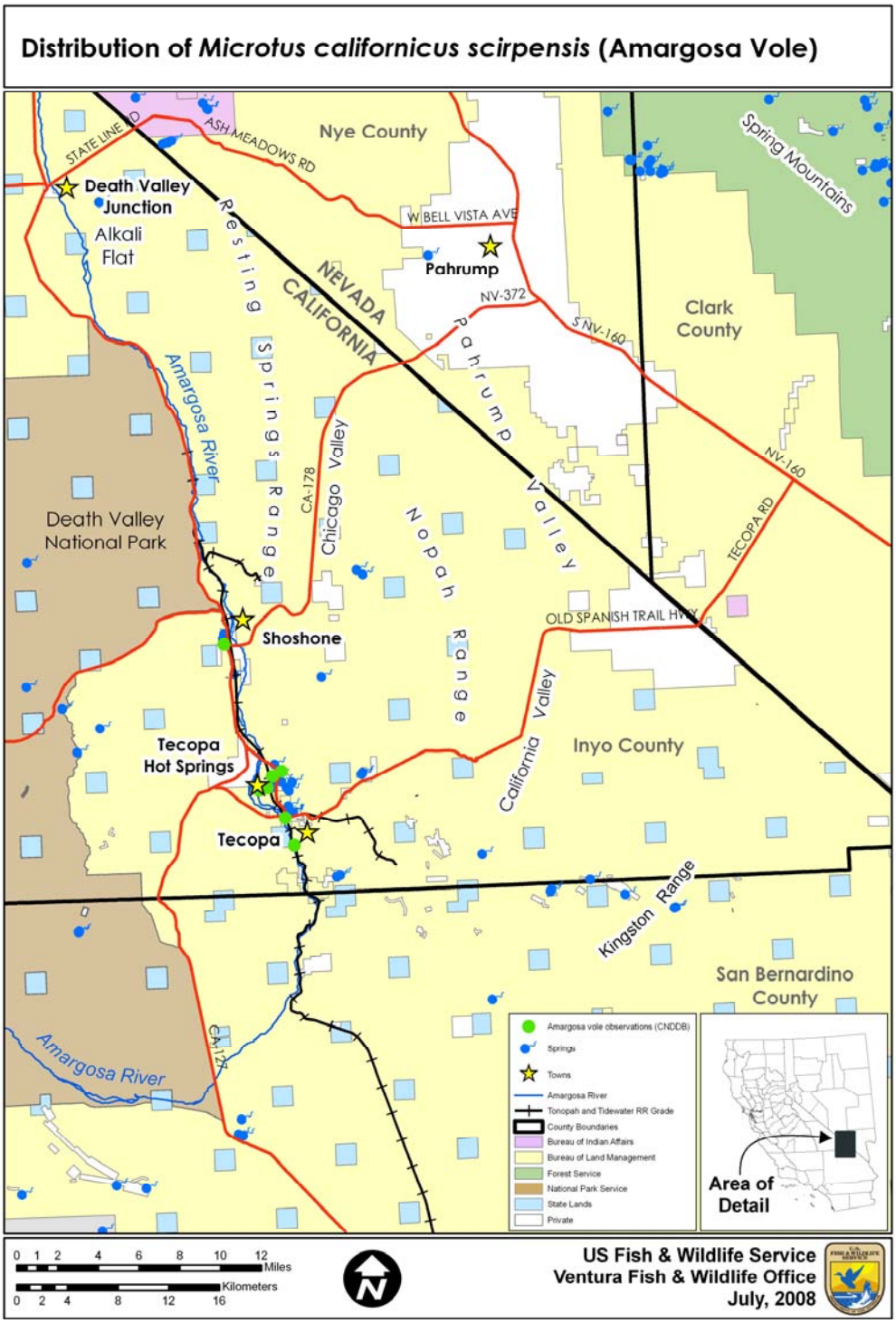

Appendix 1: Consolidated Trapping Locations 1977-2000 and Occupancy Results from McClenaghan and Montgomery (1998)
* Approximate Trapping Locations as Identified in McClenaghan and Montgomery 1998
Tonopah and Tidewater Railroad Grade
Tecopa Hot Springs Road
New occupied habitat since listing
Tecopa Hot Springs
McClenaghan and Montgomery 1998 Trapping Results
Unoccupied
Occupied


Appendix 2: Consolidated Trapping Locations 1977-2000 and Occupancy Results from McClenaghan and Montgomery (1998)
* Approximate Trapping Locations as Identified in McClenaghan and Montgomery 1998
Tonopah and Tidewater Railroad Grade
Tecopa Hot Springs Rd.
Old Spanish Trl. Hwy
Tecopa
23
11
22
9
57
60
8
36
26
18
61
25
40
41
43
Loss of occupied habitat since listing
McClenaghan and Montgomery 1998 Trapping Results
Unoccupied
Occupied

Appendix 3: Historical Amargosa vole locations from the California Natural Diversity Database



Appendix 4: Trapping, sign survey, and habitat assessment results 1977-1997

Trapping Site	Trapping Season	McClenaghan and Montgomery 1998		Murphy and Freas 1989		Rado et. al, 1984		Bleich 1979a	
		Voles	Sign	Voles	Sign	Voles	Sign	Voles	Sign
1	Spring/Summer	47	Yes						
	Fall	38							
2	Spring/Summer	0	NA						
3	Spring/Summer	0	NA						
4	Spring/Summer	1	Yes						
5	Spring/Summer	0	NA						
6	Spring/Summer	0	NA						
7	Spring/Summer	11	Yes	4	Yes			1	NA
	Fall	34		0					
8	Spring/Summer	2	Yes		No				
	Fall			0					
	Winter			0					
9	Spring/Summer	2	Yes	2	Yes			0	NA
	Fall	3							
	Winter					0	No		
10	Spring/Summer	4	Yes			1	NA		
	Winter							0	NA
11	Spring/Summer	0	NA						
12	Spring/Summer	0	Yes						
	Winter							14	NA
13	Spring/Summer	1	Yes	0	No				
	Winter			0					
14	Spring/Summer	0	Yes					1	NA
	Winter							1	NA
15	Spring/Summer	0	NA						
16	Spring/Summer	0	Yes		Yes				
	Fall	0	No						
17	Fall	2	Yes						
18	Fall	1	Yes		No				
19	NA		Yes						
20	Fall	0	NA						
21	NA		Yes						
22	NA		Yes						
23	NA		No						
25	Spring/Summer							1	NA
24	NA	No Habitat	NA						
26	Spring/Summer		No					0	NA
29	Spring/Summer		No					0	NA
30	Spring/Summer		No					0	NA
34	Spring/Summer		Yes					1	NA
	Winter							0	NA
35	Spring/Summer		No					0	NA
36	Spring/Summer		No					1	NA
40	Winter	No Habitat	NA					1	NA
41	Winter		No					0	NA
42	Winter	No Habitat	NA					0	NA
43	Spring/Summer		No			1	NA		
44	Spring/Summer	No Habitat	NA			0	No		
50	Winter	No Habitat	NA			0	No		
51	Spring/Summer	No Habitat	NA			0	No		
52	Spring/Summer		No			0	No	0	NA
53	Spring/Summer	No Habitat	NA			0	No		
54	Spring/Summer		No	0	No				
	Winter			0	Yes				
56	Spring/Summer		Yes	0	Yes				
57	Spring/Summer		No	3	Yes				
	Fall			1					
	Winter			0					
60	NA	No Habitat	NA	0	No				
61	NA		No	0	No				
62	NA		No						
63	NA		No						
64	NA	No Habitat	NA	0	No			0	NA

Table adapted from Table 1 in McClenaghan and Montgomery 1998

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW

Amargosa vole *(Microtus californicus scirpensis)*

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

____ Downlist to Threatened

____ Uplist to Endangered

____ Delist

_X_ No change needed

Appropriate Listing/Reclassification Priority Number: N/A

Review Conducted By: Brian Croft

FIELD OFFICE APPROVAL:

Field Supervisor, U.S. Fish and Wildlife Service

Approve Diane K Noda Date 1/14/09

REGIONAL OFFICE APPROVAL:

Assistant Regional Director, U.S. Fish and Wildlife Service

Approve Mel Zmi Date 2-4-09